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(54) A motor vehicle door lock

(57) A motor vehicle door lock having a rotary latch 1 and a pawl 2 has an internal locking lever 3 mounted on a fixed pivot 5 and an internal operating lever 4 pivoted at 9 on lever 3. An interior operating handle pivots lever 4 via a Bowden cable connecting at end 25 and, when the handle is moved to pull end 25 up from the fig 2 position, a portion 6 acts on surface 7 to release the pawl. If the handle is moved to push end 25 down, portion 10 engages portion 11 to pivot the lever 3 to it's locking position (fig 5). As an anti-theft measure, handle movement is decoupled from pawl release during locking since the lever 3 in it's locking position carries lever 4 to the left so that portion 6 can no longer act on surface 7.

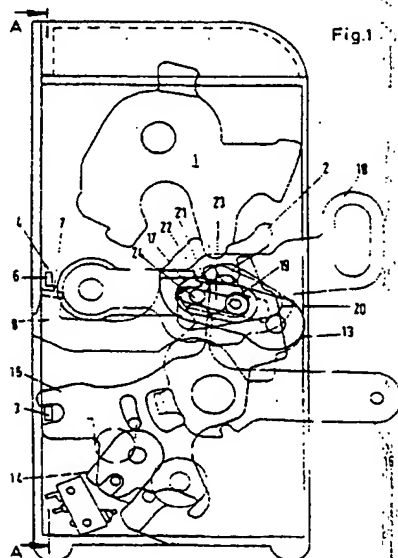


Fig.2

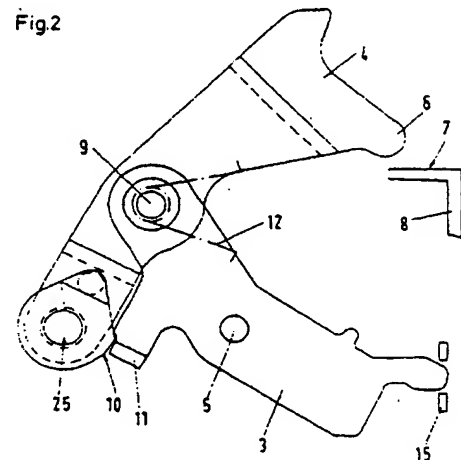
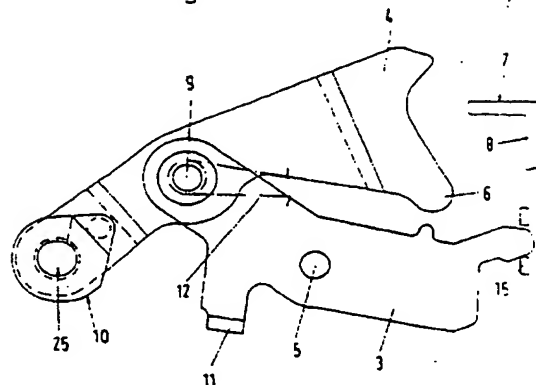


Fig.5



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Fig.1

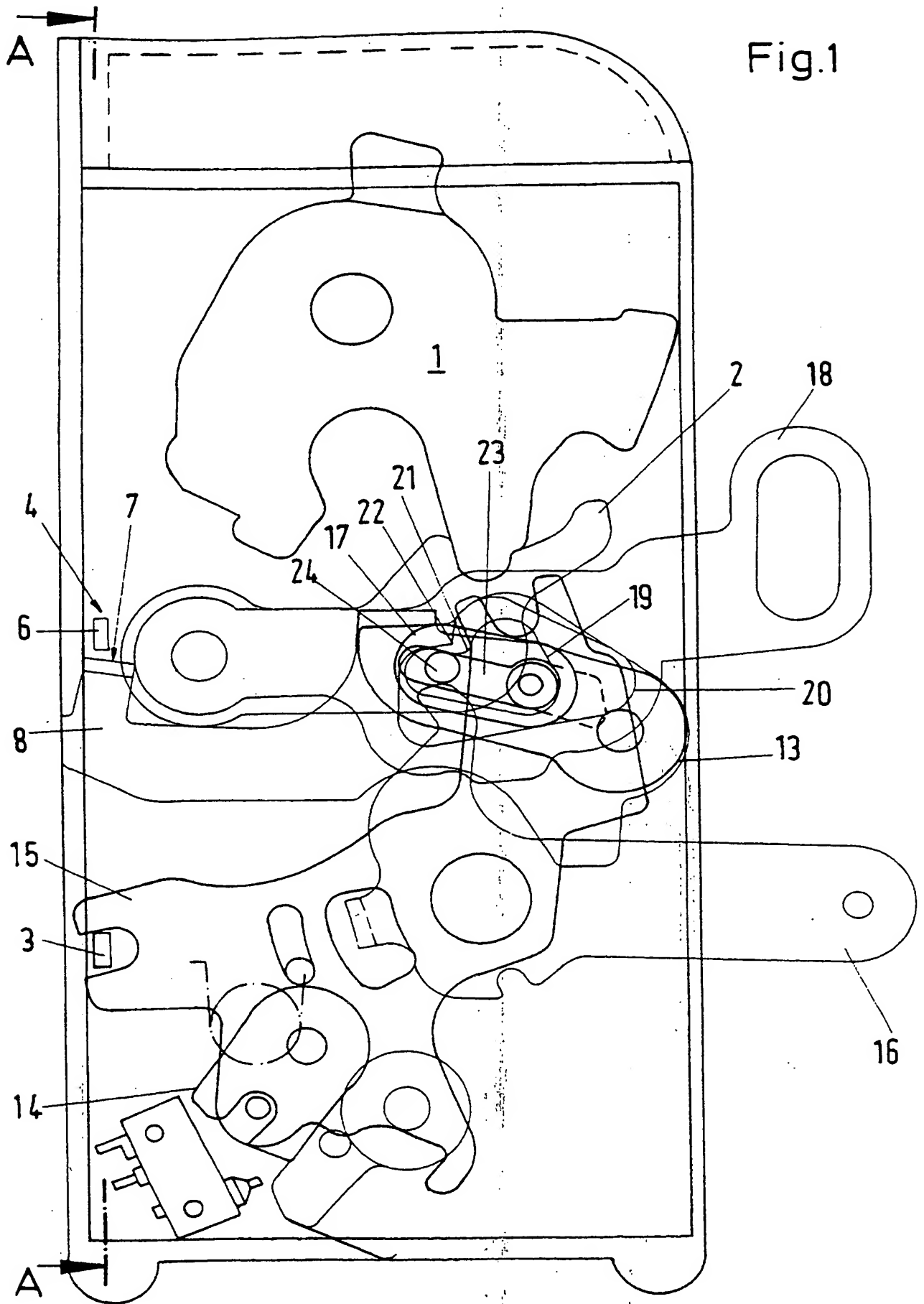


Fig.2

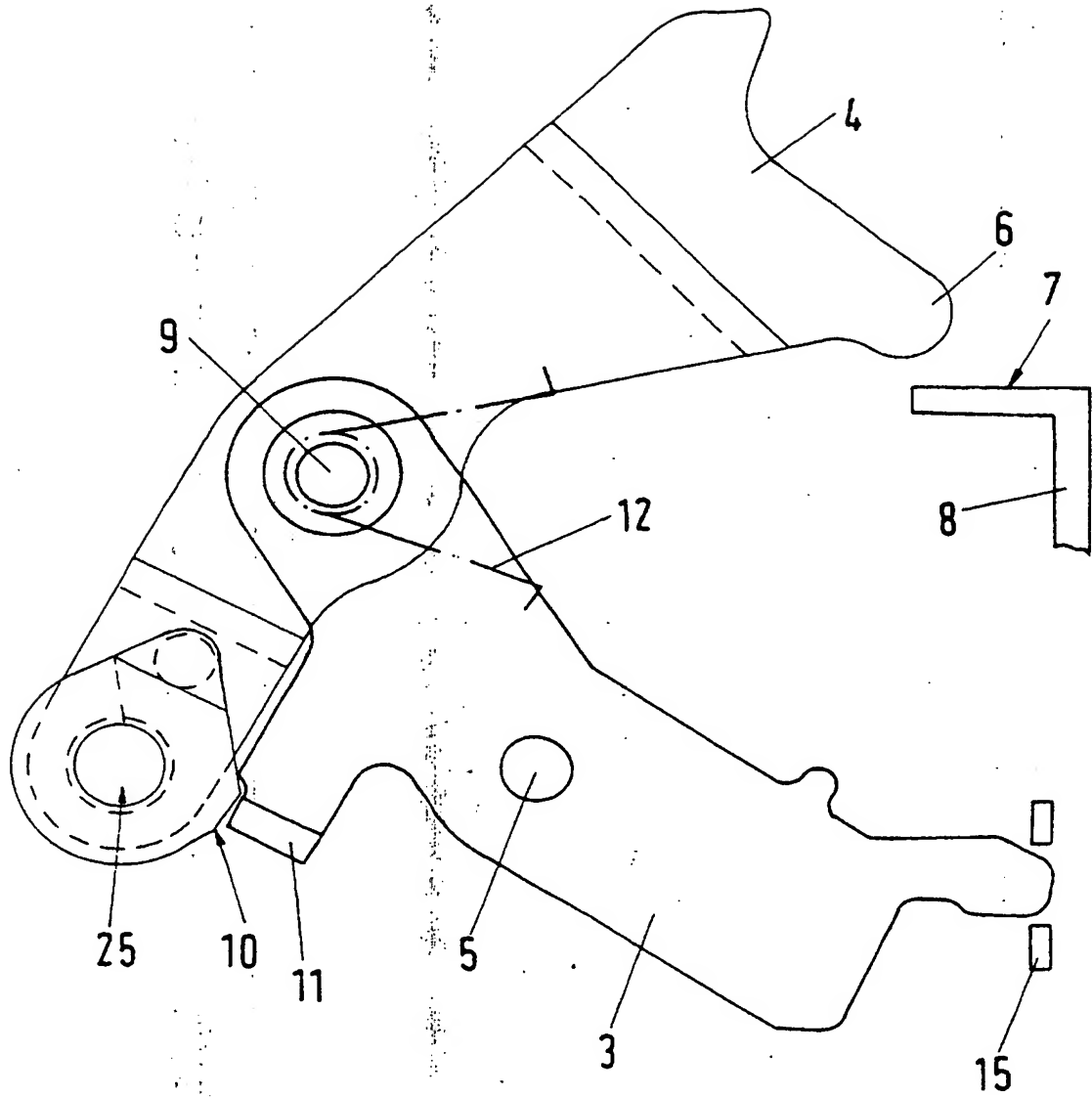


Fig.3

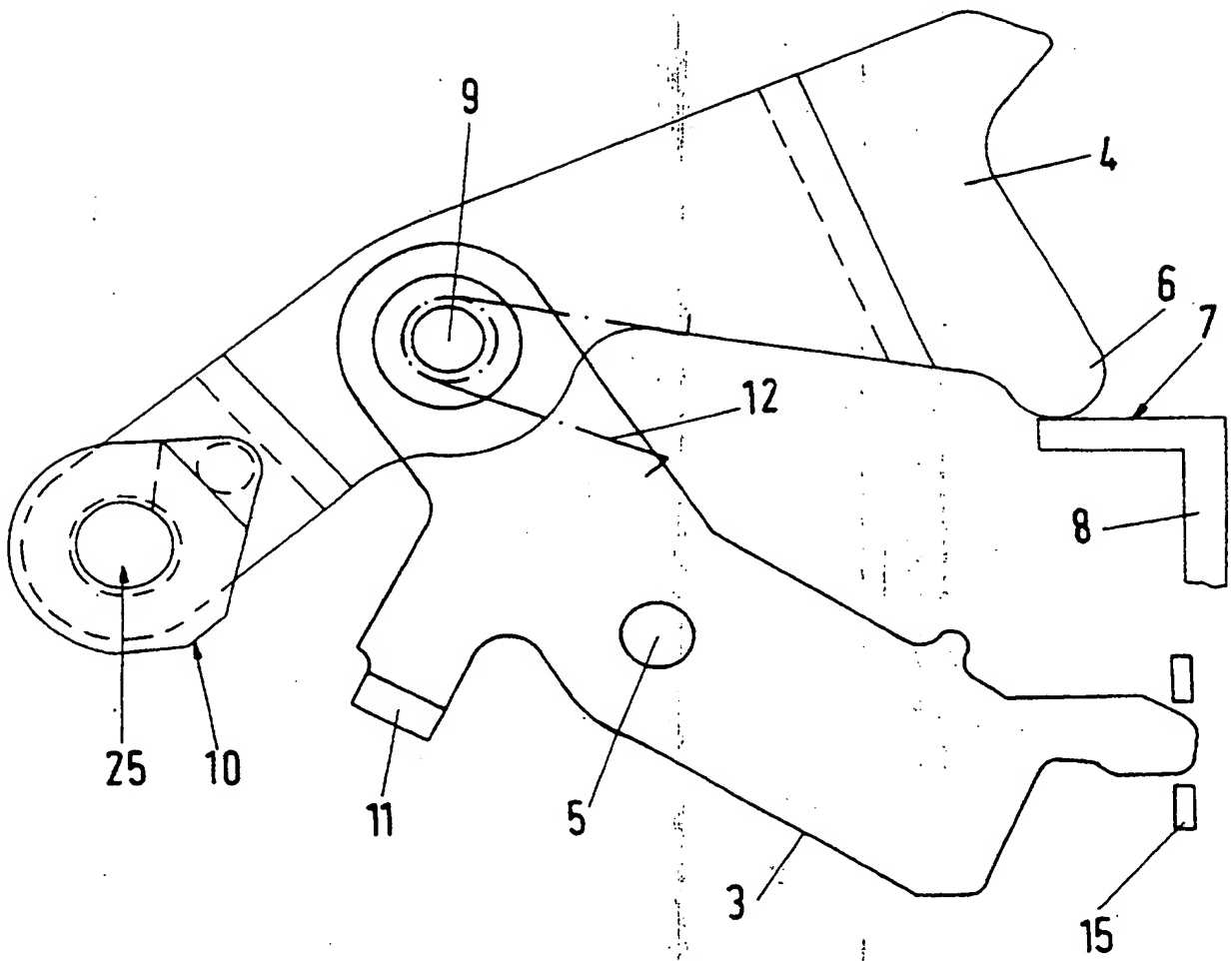


Fig.4

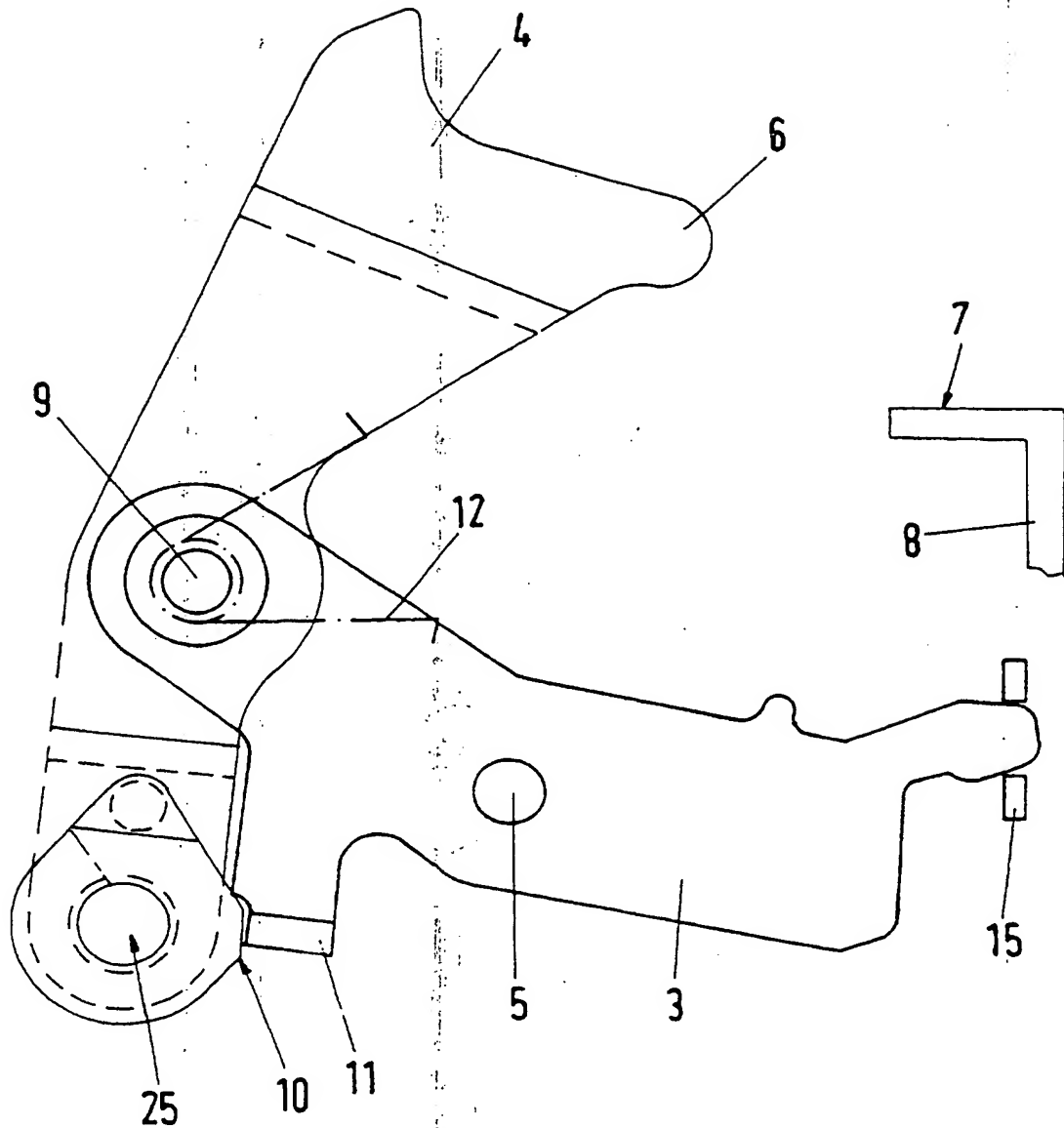
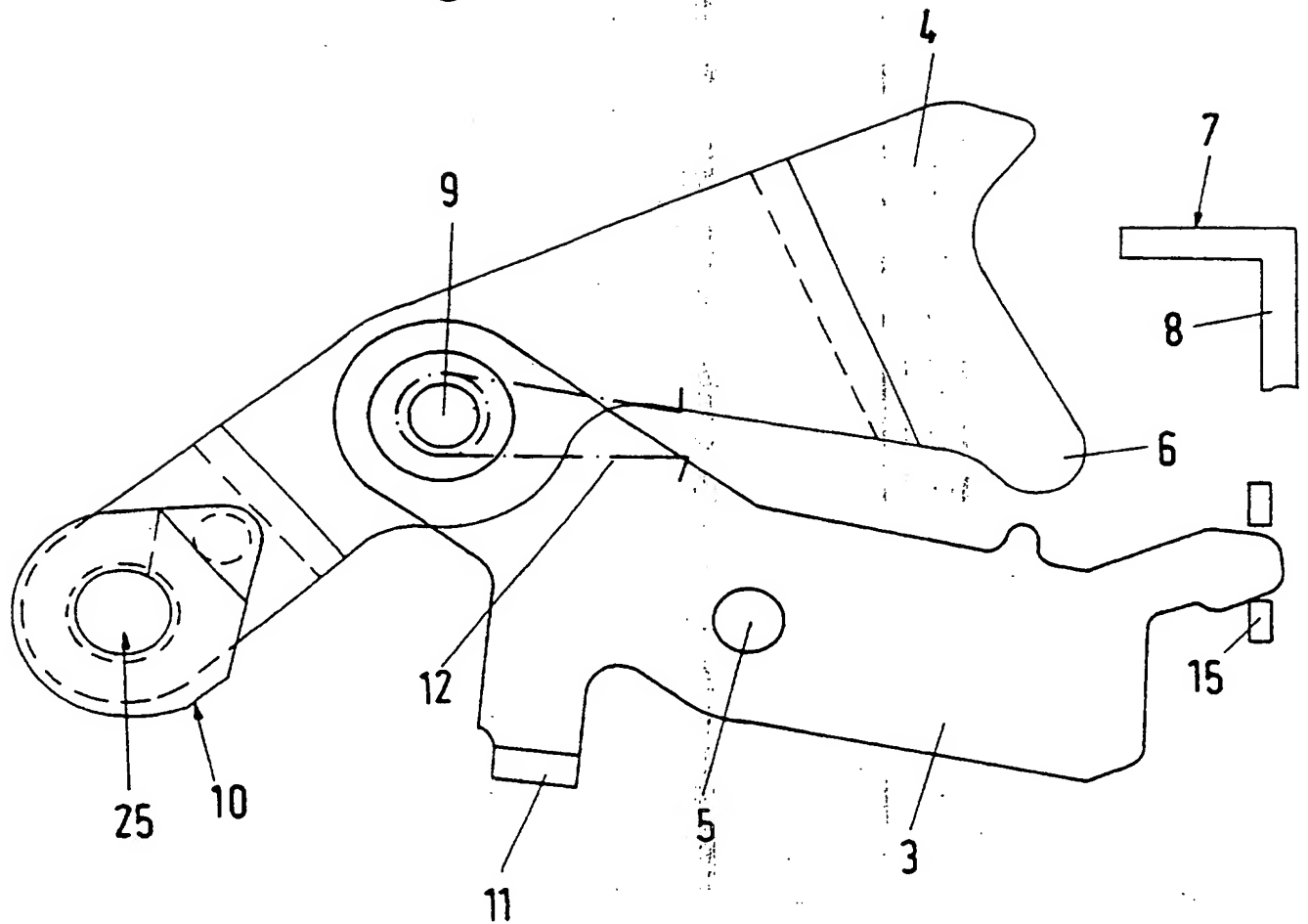


Fig.5



A MOTOR VEHICLE DOOR LOCK

A motor vehicle door lock having a rotary latch and a pawl, having a locking lever system comprising at least one interior locking lever, having an operating lever system comprising at least one interior operating lever and having an interior handle for operating and for locking and for unlocking the motor vehicle door lock via "locked", "unlocked" and "activated" positions of the interior handle, wherein the interior handle is connected to the interior operating lever and to the interior locking lever via a single Bowden cable having a Bowden cable core and a Bowden cable sheath, wherein the Bowden cable sheath is fixedly attached to the motor vehicle door lock and the Bowden cable core is fixed to the interior operating lever, wherein the interior operating lever can swivel between operating positions associated with the operating positions of the interior handle, wherein in the course of the interior operating lever swivelling between the "locked" and "unlocked" operating positions the interior locking lever can be entrained by the interior operating lever into "locked" and "unlocked" operating positions of the interior operating lever and can swivel about a fixed interior locking lever swivelling axis, wherein the interior operating lever has an interior operating lever projection, which in the "unlocked" operating position of the interior locking lever is actively connected to a force application surface of an element which effects the release of the pawl, and wherein an anti-theft function is obtained by locking the interior locking lever in its "locked" operating position. - In a

motor vehicle door lock which is provided for a front door of a motor vehicle, the locking lever system generally additionally comprises at least one exterior locking lever which is connected to a lock barrel. If a central locking drive is provided, a one-piece or two-piece locking central lever which is operated by the central locking drive is often provided in addition within the scope of the locking lever system. In addition, the operating lever system generally comprises an exterior operating lever; transmission levers may also be provided in addition. The element for releasing the pawl may be a release lever which can be operated by the operating lever system and which acts on a release pin of the pawl, or may be a transmission lever. However, the interior operating lever or another of the said lever elements of the operating lever system may also act directly on the release pin, for example. The release pin itself is then the element which effects the release of the pawl. A fixed arrangement of a component means an arrangement in which the component is disposed fixed in relation to the lock plate, a lock casing or a lock housing and is consequently disposed fixed in relation to the motor vehicle door when the motor vehicle door lock is installed. The term "anti-theft function" means that in the anti-theft position of the motor vehicle door lock it is impossible to unlock and operate the motor vehicle door lock by means of the interior handle. By this means, unauthorised opening of the motor vehicle door, by means of manipulative interventions through window apertures or door pillars for example, is at least made more difficult. Locking of the

interior locking lever for the anti-theft function may be effected by a locking element which can swivel directly into the path of the interior locking lever. Locking of the interior locking lever may also be effected indirectly, however, by the locking element being swivelled into the path of movement of a lever element disposed subsequently to the interior locking lever. A central locking drive can also be locked in its "locked" operating position.

In motor vehicle door locks of the construction cited at the outset, the dual function of the interior handle is made possible by a frictional connection between the operating lever system and the locking lever system. With this design, the interior handle cannot of course take up a "locked and activated" operating position. On the other hand, the levers of the motor vehicle door lock themselves can very readily take up a "locked and activated" operating position, particularly when the interior locking lever is locked by means of the anti-theft function. A motor vehicle door lock of the construction cited at the outset is known from document EP 0 475 037 B1. In the motor vehicle door lock which is known in this respect, the interior locking lever and the interior operating lever are mounted fixed and coaxially. The fixed mounting of the interior operating lever results in a constructional problem, since a direct overlap of the interior operating lever projection with the force application surface of the element which effects the release of the pawl can only be obtained either in all the operating positions or in none of the operating position of the motor vehicle door lock. The

result of the first possibility would be that the motor vehicle door lock would also be operable via the interior handle when the interior locking lever was locked in its "locked" operating position. This is obviously inadvisable.

5 In the motor vehicle door lock according to document EP 0 475 037 B1, this constructional problem is therefore solved by providing a coupling plate in addition, which in an "unlocked" operating position provides an (indirect) active connection between the interior operating lever projection and the force application surface, and which in a "locked" operating position is swung out of the paths of movement of the interior operating lever projection or of the force application surface at least. The coupling plate, which is thus absolutely necessary in addition, has to be designed with the appropriate kinematics. This is expensive as a whole, and is consequently

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costly and susceptible to faults.

In contrast, a basic object of the present invention is to further develop a motor vehicle door lock of the type cited at the outset so that it can be produced at reduced cost despite its anti-theft function.

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According to the present invention, there is provided a motor vehicle door lock having a rotary latch and a pawl, having a locking lever system comprising at least one interior locking lever, having an operating lever system comprising at least one interior operating lever and having an interior handle for activating and for locking and for unlocking the motor vehicle door lock via "locked", "unlocked" and "activated" positions of the interior handle,

25

wherein the interior handle is connected to the interior operating lever and to the interior locking lever via a single Bowden cable having a Bowden cable core and a Bowden cable sheath,

5 wherein the Bowden cable sheath is fixedly attached to the motor vehicle door lock and the Bowden cable core is fixed to the interior operating lever,

wherein the interior operating lever can swivel between operating positions associated with the operating positions of the interior handle,

10 wherein in the course of the interior operating lever swivelling between the "locked" and "unlocked" operating positions the interior locking lever can be entrained by the interior operating lever into "locked" and "unlocked" operating positions of the interior locking lever and can swivel about a fixed interior locking lever swivelling axis,

15 wherein the interior operating lever has an interior operating lever projection, which in the "unlocked" operating position of the interior locking lever is actively connected to a force application surface of an element which effects the release of the pawl, and

20 wherein an anti-theft function is obtained by locking the interior locking lever in its "locked" operating position,

characterised in that

25 the interior operating lever is mounted on an interior operating lever swivelling axis disposed on the interior locking lever, and

that the arrangement of the interior locking lever

swivelling axis, of the interior operating lever swivelling axis, of the interior operating lever projection and of the force application surface is effected so that in the "locked" operating position of the interior locking lever the interior operating lever projection is free from the force application surface and thus the interior operating lever and the interior handle can be moved with an inoperative stroke.

The invention is based on the recognition that, with a mounting of the interior operating lever which is not fixed and with a suitable form of the geometric ratios of the lever arms, a direct overlap of the interior operating lever projection with the force application surface can be effected in the "unlocked" operating position of the motor vehicle door lock and no overlap of the interior operating lever projection with the force application surface can be effected in the "locked" operating position of the motor vehicle door lock. As regards the geometric ratios of the lever arms, what matters is that the lever arm formed by the interior operating lever projection and the interior operating lever swivelling axis is angled in relation to the lever arm formed by the interior locking lever swivelling axis and the interior operating lever swivelling axis. The latter lever arm must also be sufficiently long. As a result, an inoperative stroke of the interior handle is effected in the anti-theft position of the motor vehicle door lock with just a few components and with a high degree of operational reliability.

A preferred embodiment of the invention which is particularly reliable in operation is characterised in that

the interior locking lever can be entrained into its "locked" operating position by the interior operating lever by means of a positive connection, preferably by a bevel on the interior locking lever striking a stop face on the interior operating lever, and that the interior locking lever can be entrained into its "unlocked" position by the interior operating lever by means of a frictional connection, preferably by a leg spring disposed between the interior locking lever and the interior operating lever. This form of construction is based on the recognition that the dual function of the interior handle can also be achieved if the frictional connection between the interior operating lever and the interior locking lever is only effected in one direction of movement. The positive connection when the interior locking lever is moved into the "locked" operating position ensures that the motor vehicle door lock is always securely locked, even if increases in the frictional conditions occur due to ageing. This applies in particular if the swivelling of the interior locking lever into its "locked" operating position is effected by means of a compressive stress of the Bowden cable core. It should be understood that if the interior locking lever swivels into its "locked" operating position by means of a tensile stress of the Bowden cable core, the frictional connection and the positive connection can correspondingly be effected in reverse.

In principle, a motor vehicle door lock according to the invention can be designed simply for manual operation. The anti-theft function is then activated mechanically, via

the lock barrel for example. However, a motor vehicle door lock which can be operated particularly easily is obtained if the locking system is connected to a central locking drive. In this situation the anti-theft function can be activated by operating a locking element by means of the central locking drive. The anti-theft function can also be provided within the central locking drive, however.

Another embodiment of the invention is characterised in that an emergency unlocking function is provided for a central locking drive which is jammed in the anti-theft position, wherein the jammed lever element of the locking lever system is connected via a frictional connection to subsequent lever elements of the locking lever system, and wherein an exterior locking lever acts on one of the subsequent lever elements. By this means, the motor vehicle door lock can be unlocked via the lock barrel, despite the central locking drive having become jammed due to a malfunction. The same of course applies when the interior locking lever is held in the "locked" operating position without the anti-theft function having been activated, due to a malfunction in the central locking drive.

The invention is described in more detail below with reference to the drawings, which merely illustrate one example, and where:

Figure 1 illustrates a motor vehicle door lock according to the invention;

Figure 2 is a section A-A through Figure 1, with the interior locking lever in the "unlocked" operating position

and with the interior operating lever in the operating position associated with the "unlocked" operating position of the interior handle;

5 Figure 3 corresponds to Figure 2, but with the interior locking lever in the "unlocked" operating position and with the interior operating lever in the operating position associated with the "activated" position of the interior handle;

10 Figure 4 also corresponds to Figure 2, but with the interior locking lever in the "locked" operating position and with the interior operating lever in the operating position associated with the "locked" position of the interior handle;

15 Figure 5 also corresponds to Figure 2, but with the interior locking lever in the "locked" operating position and with the interior operating lever in the operating position associated with the "activated" position of the interior handle, with the interior locking lever locked.

20 It can firstly be seen from Figure 1 that the motor vehicle door lock is constructed with a rotary latch 1, with a pawl 2, with a release lever 13 for the pawl 2 and with an operating lever system acting on the release lever 13. In addition, the motor vehicle door lock has a central locking drive with a driven element 14. The central locking drive itself is not shown, for the sake of clarity. It can also be
25 seen that a locking central lever 15 is provided, which can be swivelled firstly by means of the central locking drive and secondly by means of an interior locking lever 3 and/or an exterior locking lever 16. A coupling lever 17 is provided

with the locking central lever 15, for coupling the operating lever system to the release lever 13 in the "unlocked" operating position of the interior locking lever 3 and for uncoupling the operating lever system from the release lever 13 in the "locked" operating position of the interior locking lever 3. In detail, the operating lever system comprises an interior operating lever 4, a transmission lever 8 and an exterior operating lever 18, wherein the transmission lever 8 and the exterior operating lever 18 each have a recess 19, 20 with a carrier projection 21, 22, wherein the release lever 13 has a release lever slot 23 extending substantially in the longitudinal direction of the release lever 13, wherein the carrier projections 21, 22 and one end of the release lever slot 23 are substantially in alignment with each other, and wherein the coupling lever 17 has a coupling pin 24, which passes through the recesses 19, 20 and through the release lever slot 23. Means are also provided for locking the interior locking lever 3 and/or the locking central lever 15 in the "locked" operating position, by means of which an anti-theft function is effected. For the sake of clarity, these means are not illustrated.

The motor vehicle door lock has an interior handle, which is not illustrated in the Figures, for activating and for locking and unlocking the motor vehicle door lock via "locked", "unlocked" and "activated" operating positions of the interior handle. In this respect, the interior handle is connected to the interior operating lever 4 and to the interior locking lever 3 via a single Bowden cable having a

Bowden cable core and a Bowden cable sheath. The Bowden cable sheath is fixedly attached to the motor vehicle door lock and the Bowden cable core is fixed to the interior operating lever 4. The interior operating lever 4 has a Bowden cable core attachment point 25 for this purpose.

It can be seen from a comparative examination of Figures 2 to 5 that the interior operating lever 4 can swivel between operating positions associated with the operating positions of the interior handle, wherein in the course of the interior operating lever 4 swivelling between the "locked" and "unlocked" operating positions the interior locking lever 3 can be entrained by the interior operating lever 4 into the "locked" and "unlocked" operating positions of the interior operating lever 3 and can swivel about a fixed interior locking lever swivelling axis 5. The interior operating lever 4 has an interior operating lever projection 6, which in the "unlocked" operating position of the interior operating lever 4 as shown in Figure 3 is actively connected to a force application surface 7 of an element 8 which effects the release of the pawl 2. In the embodiment illustrated, this element is the transmission lever 8.

In detail, the interior operating lever 4 is mounted on an interior operating lever swivelling axis 9 disposed on the interior locking lever 3. In particular, a comparative examination of Figures 2 to 5 shows that the arrangement of the interior locking lever swivelling axis 5, of the interior operating lever swivelling axis 9, of the interior operating lever projection 6 and of the force application surface 7 is

effected so that in the "locked" operating position of the interior locking lever 3 the interior operating lever projection 6 is free from the force application surface 7 and thus the interior operating lever 4 and the interior handle can be moved with an inoperative stroke. It can be seen from a comparison of Figures 2 and 3 that a normal operating stroke is executed at the Bowden cable core attachment point 25. This normal operating stroke corresponds to a movement of the interior handle between the "unlocked" and "activated" operating positions. A normal locking stroke at the Bowden cable core attachment point 25 can be seen from a comparison of Figures 3 and 4, where the interior handle is moved between its "unlocked" and "locked" operating positions. In this respect it should be understood that the "locked" operating position of the interior handle is opposite the "activated" operating position of the interior handle. A special inoperative stroke at the Bowden cable core attachment point 25, when the interior locking lever 3 is locked for the purpose of theft protection and there is unauthorised manipulation of the interior handle, can be seen from a comparison of Figures 4 and 5. This special inoperative stroke corresponds to a movement of the interior handle between its "locked" and "activated" operating positions. It can also be seen from a comparison of Figures 4 and 5 that in the course of the special inoperative stroke the interior operating lever projection 6 is moved past the force application surface 7 of the transmission lever 18.

It can also be seen from Figures 2 to 5 that the

interior locking lever 3 can be entrained into its "locked" operating position by the interior operating lever 4 by means of a bevel 11 on the interior locking lever 3 striking a stop face 10 on the interior operating lever 4. Conversely, the interior locking lever 3 can be entrained into its "unlocked" position by the interior operating lever 4 by means of a leg spring 12 disposed between the interior locking lever 3 and the interior operating lever 4. If it is necessary to provide an emergency unlocking function for a central locking drive which is jammed in the anti-theft position, the locking central lever 15 can be split in a suitable manner into partial locking central levers, with the partial locking central levers being joined to each other via a frictional connection. It should be understood that assignments of the points of application of the central locking drive and/or of the exterior locking lever 16 which are suitable for this purpose must be associated with the two partial locking central levers.

Finally, it can be seen from Figure 1 that a displaceable mounting of the coupling lever 17 on the locking lever 15 is provided in this embodiment as a convenience function. By this means, the motor vehicle door lock can also be unlocked when the exterior operating lever 18 is activated.

CLAIMS

1. A motor vehicle door lock having a rotary latch and a pawl, having a locking lever system comprising at least one interior locking lever, having an operating lever system comprising at least one interior operating lever and having an interior handle for activating and for locking and for unlocking the motor vehicle door lock via "locked", "unlocked" and "activated" positions of the interior handle,

wherein the interior handle is connected to the interior operating lever and to the interior locking lever via a single Bowden cable having a Bowden cable core and a Bowden cable sheath,

wherein the Bowden cable sheath is fixedly attached to the motor vehicle door lock and the Bowden cable core is fixed to the interior operating lever,

wherein the interior operating lever can swivel between operating positions associated with the operating positions of the interior handle,

wherein in the course of the interior operating lever swivelling between the "locked" and "unlocked" operating positions the interior locking lever can be entrained by the interior operating lever into "locked" and "unlocked" operating positions of the interior locking lever and can swivel about a fixed interior locking lever swivelling axis,

wherein the interior operating lever has an interior operating lever projection, which in the "unlocked" operating position of the interior locking lever is actively connected to a force application surface of an element which effects the

release of the pawl, and

wherein an anti-theft function is obtained by locking the interior locking lever in its "locked" operating position, characterised in that

5 the interior operating lever is mounted on an interior operating lever swivelling axis disposed on the interior locking lever, and

10 that the arrangement of the interior locking lever swivelling axis, of the interior operating lever swivelling axis, of the interior operating lever projection and of the force application surface is effected so that in the "locked" operating position of the interior locking lever the interior operating lever projection is free from the force application surface and thus the interior operating lever and the interior
15 handle can be moved with an inoperative stroke.

2. A motor vehicle door lock according to claim 1, characterised in that the interior locking lever can be entrained into its "locked" operating position by the interior operating lever by means of a positive connection, preferably
20 by a bevel on the interior locking lever striking a stop face on the interior operating lever, and that the interior locking lever can be entrained into its "unlocked" position by the interior operating lever by means of a frictional connection, preferably by a leg spring disposed between the interior
25 locking lever and the interior operating lever.

3. A motor vehicle door lock according to claim 1 or 2, characterised in that the locking lever system is connected to a central locking drive.

4. A motor vehicle door lock according to any one of claims 1 to 3, characterised in that an emergency unlocking function is provided for a central locking drive which is jammed in the anti-theft position due to a malfunction, wherein the jammed lever element of the locking lever system is connected via a frictional connection to subsequent lever elements of the locking lever system.

5. A motor vehicle door lock substantially as hereinbefore described with reference to the accompanying drawings.

Application No: GB 9607377.0
Claims searched: 1-4

Examiner: Philip Silvie
Date of search: 27 June 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.O): E2A (AARN, AMXG)
Int Cl (Ed.6): E05B (65/20, 65/32)
Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2 161 854 A (FORD) see fig 3A	1
A	EP 0 475 037 A1 (BOMORO) see fig 1	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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